Taxonomic review of the ant genus *Echinopla* (Hymenoptera: Formicidae) in China

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Abstract: Three species of the ant genus *Echinopla* are recognized in China: *E. cherapunjiensis*, *E. striata* and *E. lateropilosa*. The last one is recorded for the first time in China. Morphological descriptions, measurements, distribution and high-resolution color pictures of the worker caste of each species are provided. A key to the known Chinese species based on worker caste is presented.

Key words: Formicinae; Camponotini; taxonomy

中国海胆蚁属分类研究（膜翅目：蚁科）

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摘要：记录中国海胆蚁属 *Echinopla* 蚂蚁 3 种，即乞拉朋海胆蚁 *E. cherapunjiensis*、条纹海胆蚁 *E. striata* 和侧毛海胆蚁 *E. lateropilosa*，后者为中国新记录种。提供了工蚁形态描述、测量数据、地理分布和高清彩图，编制了工蚁分种检索表。

关键词：蚁亚科；弓背蚁族；分类

Introduction

Echinopla Smith, 1857 belonging to the tribe Camponotini of the subfamily Formicinae is mainly distributed in the Oriental, Indo-Australian and Australasian Regions (Zettel & Laciny 2015). A total of 39 species in this genus are recorded in the world (Bolton 2021). Almost all of the species of this genus inhabit the canopy of trees and are hard to collect. Most species were described based on a single or very few individuals occasionally collected in the 19th century. In recent years, Zettel & Laciny (2015) have successfully obtained a number of specimens by using the tree fogging method and have described 8 new species from Borneo, Malaysia, Thailand and the Philippines. Considering the lack of systematic research, Xu & Zhou (2015) proposed the first morphologically-defined species groups for *Echinopla* and provided an identification key to the known species of the world. However, some of the

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species described by Zettel & Laciny (2015) could not be accurately assigned to the species groups proposed by Xu & Zhou (2015). Therefore, Zettel & Laciny (2017) updated the taxonomy of the species groups of *Echinopla*. Both the works of Xu & Zhou (2015) and Zettel & Laciny (2017) have established a solid foundation for future classification of this genus.

In China, only two species of this genus were previously reported, namely, *Echinopla cherapunjiensis* (Liu *et al.* 2015; Xu & Zhou 2015; Fontanilla *et al.* 2019) and *Echinopla striata* (Xu & Zhou 2015). In this study, *Echinopla lateropilosa* Zettel & Laciny, 2017 is first recorded from China, and detailed descriptions of these three known Chinese species are presented with an identification key and high-resolution images for the workers.

Material and methods

All materials are deposited in the Insect Collection of Guangxi Normal University, Guilin, China. Specimens were examined using a Nikon SMZ745 stereomicroscope. Extended depth of fixed specimen images were taken by a VHX–6000 microscopic analysis system. All measurements are given in millimeters. Standard measurements and indices are as defined by Bolton (1975), with addition of ED and MSL as outlined below:

CI — Cephalic Index = HW × 100 / HL;

DPI — Dorsal Petiole Index = DPW × 100 / PL;

DPW — Dorsal Petiole Width: maximum width of petiole in dorsal view;

ED — Eye Diameter: maximum diameter of eye;

HL — Head Length: maximum length of head in perfect full-face view from the mid-point of the anterior clypeal margin to the midpoint of the posterior margin. In species where one or both of these margins are concave, the measurement is taken from the mid-point of a transverse line that spans the apices of the projecting portions;

HW — Head Width: maximum full-face view distance across head, excluding the eyes;

LPI — Lateral Petiole Index = PH × 100 / PL;

MSL — Mesosoma Length: diagonal length of the mesosoma in lateral view, measured from the point at which the pronotum meets the cervical shield to the posterior basal angle of the metapleuron;

PH — Petiole Height: height of petiole measured in lateral view from the apex of the ventral (subpetiolar) process vertically to a line intersecting the dorsalmost point of the node;

PL — Petiole Length: length of petiole measured in lateral view from the anterior process to the posteriormost point of the tergite, where it surrounds the gastral articulation;

PW — Pronotal Width: maximum width of pronotum measured in dorsal view;

SI — Scape Index = SL × 100 / HW;

SL — Scape Length: straight-line length of the antennal scape, excluding the basal constriction or neck;

TL — Total Length: total outstretched length of the individual, from the mandibular apex to the gastral apex.

Taxonomy

Genus *Echinopla* Smith, 1857

Echinopla Smith, 1857: 79. Type species: *Echinopla melanarctos*.

*Mesoxen*a Smith, 1860: 106. Type species: *Mesoxena mistura*. *S*ynonymized by Bolton, 1994: 50.

Distribution. Southern China to Australia.

Diagnosis. This genus is very similar to the genus *Polyrhachis*, and the main differences are the former with orifice of metapleural gland, the first segment of gaster well developed, more than half of the gaster, and the petiole usually spiny or toothed.

Key to Chinese species of *Echinopla* based on the worker caste

1. Head, mesosoma and gaster longitudinally striate ····· *E. striata* Smith
-. Head, mesosoma and gaster bluntly spined or smooth and shiny ····· 2
2. Body surface bluntly spined; dorsum of mesosoma almost straight in lateral view ····· ····· *E. cherapunjiensis* Bharti & Gul
-. Head and mesosoma smooth and shiny; dorsal outline of mesosoma interrupted by narrowly notched metanotal groove in lateral view ····· *E. lateropilosa* Zettel & Laciny

1. *Echinopla cherapunjiensis* Bharti & Gul, 2012 (Fig. 1)

Echinopla cherapunjiensis Bharti & Gul, 2012: 53, figs 1–3 (w.). India.

Description of workers. In full-face view, head approximately globose, posterior margin feebly convex. Eyes very prominent, nearly circular, positioned behind the midline of the head. Clypeus weakly convex. Frontal lobes conspicuously convex and concealing antennal fossae. Mandibles short and triangular, masticatory margin with five teeth. Antennae 12-segmented, scapes slender and beyond posterior margin of head. In lateral view, dorsum of mesosoma almost straight, metanotal groove weakly impressed. Propodeal dorsum nearly straight, declivity moderately convex, posterodorsal corner rounded. In dorsal view, mesosoma narrowed between promesonotum and propodeum, promesonotal suture obsolete, metanotal groove clear. Petiole surface with seven tooth-like spines. Gaster subglobose. Body surface densely retirugose, head, mesosoma, petiole and basal part of gaster with short blunt spines on the interface, each spine with a long seta at its apex; mandibles smooth, sparsely punctured. Body surface covered with dense erect to suberect hairs. Body color black, mandibles, antennae, eyes and legs light brown to dark brown.

Measurements. CI 106–113, DPI 125–150, DPW 0.09–0.1, ED 0.03–0.04, HL 0.15–0.15, HW 0.15–0.17, LPI 85–100, MSL 0.18–0.2, PH 0.06–0.07, PL 0.06–0.08, PW 0.14–0.16, SI 86–88, SL 0.12–0.15, TL 0.51–0.60 (n = 5).

Specimens examined. 2 workers, **China,** Guangxi Zhuang Autonomous Region, Fangchenggang City, Fuxiang Protection Station, 22-X-2013, Liwei LIANG leg.; 4 workers, Guangxi Zhuang Autonomous Region, Fangchenggang City, Shiwandashan, 02-XII-2001, Jianhua HUANG leg., No. G010006; 5 workers, Guangxi Zhuang Autonomous Region, Fangchenggang City, Jinhuacha Natural Reserve, 12-V-2010, Zhilin CHEN leg., No. G096212.

Distribution. China (Guangxi, Yunnan, Tibet); Malaysia; India (type locality); Laos; Myanmar.

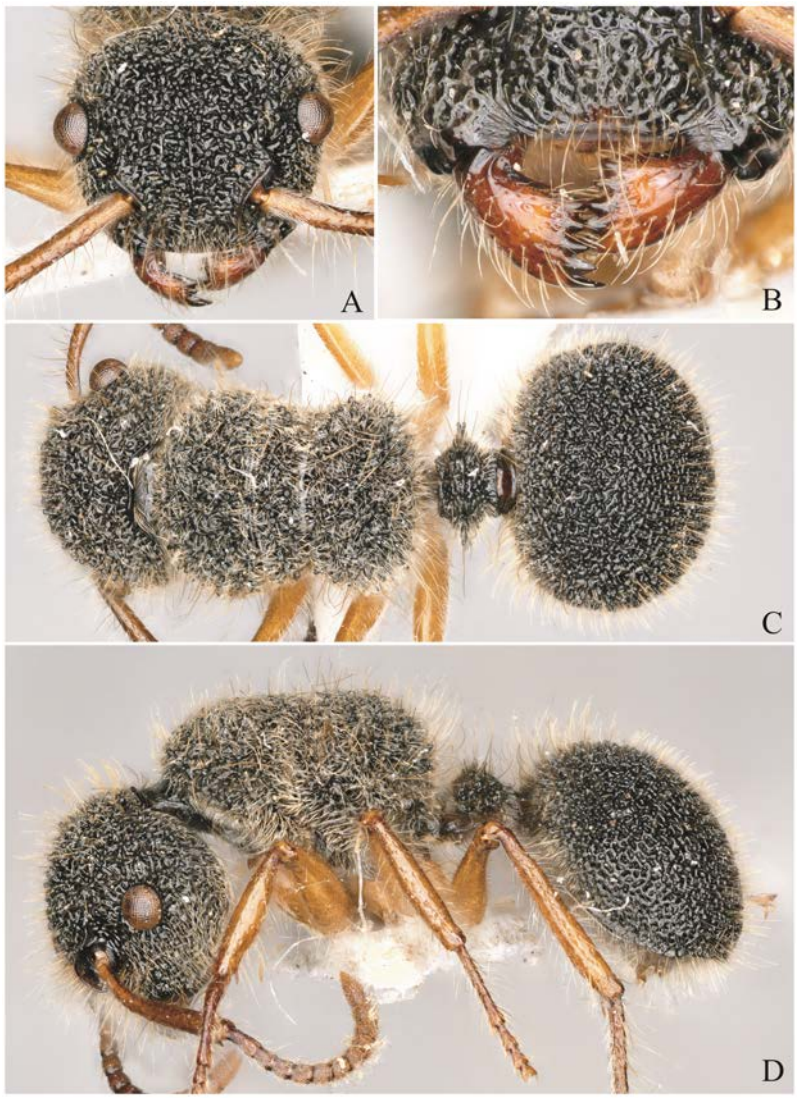

Figure 1. *Echinopla cherapunjiensis* worker. A. Head, full-face view; B. Mandible, dorsal view; C. Body, dorsal view; D. Body, profile view.

2. ***Echinopla striata* Smith, 1857** (Fig. 2)

Echinopla striata Smith, 1857: 80 (w.). West Malaysia.

Description of workers. In full-face view, head roughly trapezoidal, posterior margin weakly convex, posterior corners rounded. Eyes circular and weakly convex, positioned behind the midline of the head. Mandibles short and with five teeth. Anterior margin of clypeus weakly convex. Frontal lobes weakly elevated and concealing part of antennal fossae. Antennae 12-segmented, scape surpass posterior margin of head. In lateral view, promesonotum convex, promesonotal suture obsolete, metanotal groove deeply impressed. Propodeum weakly convex dorsally, posterodorsal corner rounded, declivity strongly convex. Petiole roughly cuneiform and sloped posteriorly, anterodorsal corner prominent. Gaster

elongated ovoid. In dorsal view, mesosoma strongly constricted at metanotal position; promesonotum roughly trapezoidal and narrowed posteriorly, humeral corners bluntly angled, laterally notched at promesonotal suture position, promesonotal suture visible but not impressed, metanotal groove deeply impressed. Propodeum roughly trapezoidal and widening posteriorly, posterolateral corners bluntly angled. Petiole transverse, about as wide as propodeum, each side with a long spine. Head, mandibles, mesosoma and gaster longitudinally striate, sides of mesosoma finely reticulate, petiole coarsely rugose. Body surface with dense erect to suberect hairs and dense decumbent pubescence. Body color black, eyes grayish brown.

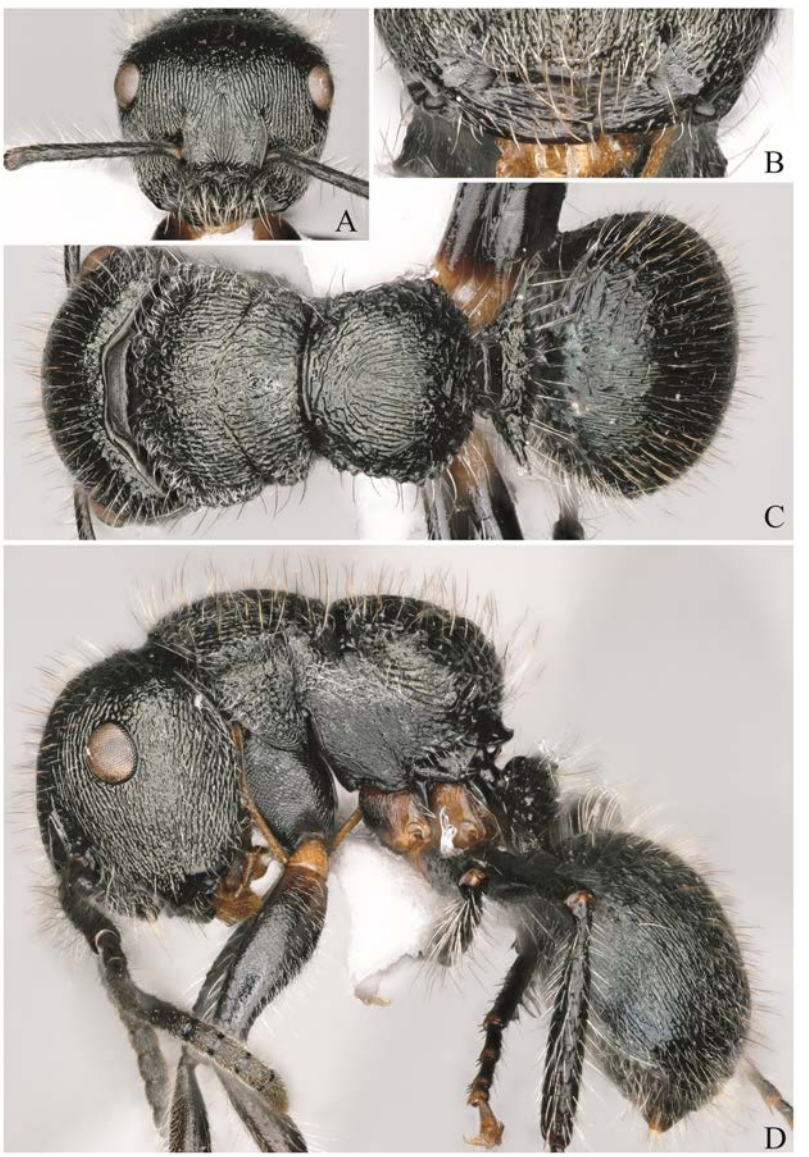

Figure 2. *Echinopla striata* worker. A. Head, full-face view; B. Mandible, dorsal view; C. Body, dorsal view; D. Body, profile view.

Measurements. CI 108–125, DPI 157–200, DPW 0.11–0.12, ED 0.03, HL 0.12–0.13, HW 0.14–0.15, LPI 67–71, MSL 0.16–0.19, PH 0.04–0.05, PL 0.06–0.07, PW 0.12–0.13, SI 73–86, SL 0.11–0.12, TL 0.46–0.51 (n = 4).

Specimens examined. 4 workers, **China,** Yunnan Province, Xishuangbanna Dai Autonomous Prefecture, Mengla County, 06-VIII-2016, Yunchuag XIONG leg., No. GXNU167631.

Distribution. China (Yunnan, Guangxi); Borneo; Indonesia; Malaysia (type locality), Philippines.

3. ***Echinopla lateropilosa* Zettel & Laciny, 2017** (Fig. 3), new record to China

Figure 3. *Echinopla lateropilosa* worker. A. Head, full-face view; B. Mandible, dorsal view; C. Body, dorsal view; D. Body, profile view.

Echinopla lateropilosa Zettel & Laciny, 2017: 10, figs 1–4 (w.). West Malaysia.

Description of workers. In full-face, head roughly trapezoidal, posterior margin convex, posterior corners rounded. Eyes convex, positioned behind midline of head. Frontal lobes covering halves of antennal fossae. Antennae 12-segmented, scapes surpassing posterior margin of head. Mandibles with five teeth on the masticatory margin. In lateral view, promesonotum and propodeum moderately convex, promesonotal suture obsolete, metanotal groove deeply impressed; propodeal dorsum and declivity forming a single rounded arch. Petiole longer than high, roughly triangular, anterodorsal corner higher and prominent, narrowed posteriorly. Gaster elongate ovoid. In dorsal view, mesosoma strongly constricted at metanotal groove position, promesonotum roughly trapezoidal and narrowed posteriorly, humeral corners shortly toothed, promesonotal suture absent, metanotal groove deeply impressed; propodeum roughly trapezoidal and widening posteriorly, posterolateral corners rounded. Petiole transverse, about as broad as propodeum, each side with a posterolaterally pointed long spine. Gaster elongate ovoid. Mandibles longitudinally rugose; head, mesosoma, petiole and gaster smooth and shiny; clypeus, lateral margins of mesosoma and petiole, and anterior face of gaster with piliferous punctures. Body surface with abundant erect to suberect hairs and dense depressed pubescence, hairs and pubescence becoming sparser on head dorsum, promesonotal dorsum and propodeal dorsum. Body color black, with weak bluish to greenish reflections; palpi, coxae and trochanters brownish yellow; eyes grey.

Measurements. CI 108–109, DPI 125–143, DPW 0.10-0.11, ED 0.03, HL 0.11–0.12, HW 0.12–0.13, LPI 57–63, MSL 0.18, PH 0.04–0.05, PL 0.07–0.08, PW 0.10–0.11, SI 77–92, SL 0.10–0.11, TL 0.49–0.53 (n = 4).

Specimens examined. 4 workers, **China,** Yunnan Province, Xishuangbanna Dai Autonomous Prefecture, Mengla County, 06-VIII-2018, Yunchuang XIONG leg., No. GXNU188355.

Distribution. China (Yunnan); Malaysia (type locality).

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References

Bharti H & Gul I. 2012. *Echinopla cherapunjiensis* sp. n. (Hymenoptera, Formicidae) from India. *Vestnik Zoologii*, 46: 371–373.

Bolton B. 1975. A revision of the ant genus *Leptogenys* Roger in the Ethiopian region, with a review of the

Malagasy species. *Bulletin of the British Museum* (*Natural History*) (*Entomology*), 31: 235–305.

Bolton B. 1994. *Identification Guide to the Ant Genera of the World*. Harvard University Press, Cambridge, Mass, 222 pp.

Bolton B. 2021. An Online Catalog of the Ants of the World. Available from http: //AntWeb.org (Accessed 7 May 2021).

Fontanilla AM, Nakamura A, Xu ZH, Cao M, Kitching RL, Tang Y & Burwell CJ. 2019. Taxonomic and functional ant diversity along tropical, subtropical, and subalpine elevational transects in southwest China. *Insects*, 10(5): 128; doi:10.3390/insects10050128.

Liu C, Guénard B, Garcia FH, Yamane S, Blanchard B, Yang DR & Economo E. 2015. New records of ant species from Yunnan, China. *ZooKeys*, 477: 17–78.

Smith F. 1857. Catalogue of the hymenopterous insects collected at Sarawak, Borneo; Mount Ophir, Malacca; and at Singapore, by A. R. Wallace [part]. *Journal and Proceedings of the Linnean Society of London. Zoology*, 2: 42–88.

Smith F. 1860. Catalogue of hymenopterous insects collected by Mr. A. R. Wallace in the islands of Bachian, Kaisaa, Amboyna, Gilolo, and at Dory in New Guinea. *Journal and Proceedings of the Linnean Society of London. Zoology* 5(17b) (suppl. to vol. 4): 93–143.

Xu ZH & Zhou XY. 2015. Species grouping and key to known species of the ant genus *Echinopla* Smith (Hymenoptera: Formicidae) with reports of Chinese species. *Asian Myrmecology*, 7: 19–36.

Zettel, H & Laciny A. 2015. Contributions to the taxonomy of the ant genus *Echinopla* Smith, 1857 (Hymenoptera, Formicidae). *Deutsche entomologische Zeitschrift*, 62: 101–121.

Zettel H & Laciny A. 2017. Further additions to the taxonomy and distribution of the ant genus *Echinopla*. *Annalen des Naturhistorischen Museums in Wien, B*, 119: 7–16.